Schroedinger

$$H\Psi = E\Psi$$

$$\frac{d(\sin(x))}{dx} = -\cos(x)$$

$$\frac{d^2(\sin x)}{d^2x} = (-1)\sin x$$

H Hamiltonian operator

$$H \equiv \left[\frac{-h^2}{8\pi^2 m}\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}+\frac{\partial^2}{\partial z^2}\right)-\frac{Ze^2}{4\pi\epsilon_0\sqrt{x^2+y^2+z^2}}\right]$$

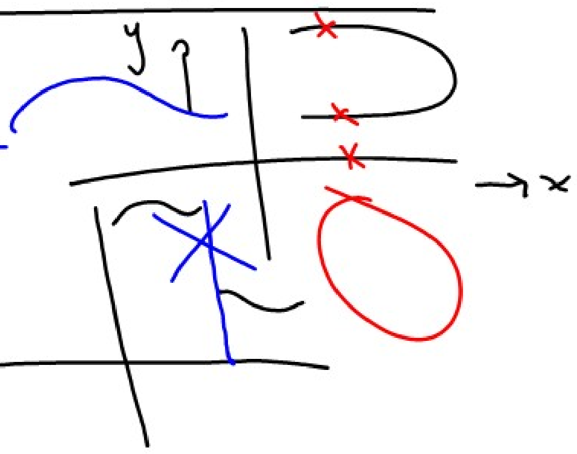
$$\left[\frac{-h^2}{8\pi^2 m}\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}+\frac{\partial^2}{\partial z^2}\right)+\left(-\frac{Ze^2}{4\pi\epsilon_0 r}\right)\right]\Psi = E\Psi$$

$$\left[\frac{-h^2}{8\pi^2 m}\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}+\frac{\partial^2}{\partial z^2}\right)+\underbrace{V_{(x,y,z)}}_{\text{P.E.}}\right]\Psi = E\Psi$$

① $\Psi \rightarrow$ single valued

② $\Psi \rightarrow$ continuous

③ as $x \rightarrow \infty$ ψ approaches zero

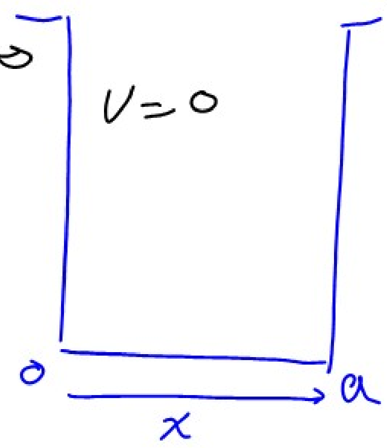


④ $\int_{-\infty}^{+\infty} \psi_A \cdot \psi_A^* \, d\tau$ $\quad \psi^*$ involves $\sqrt{-1}$

$$\boxed{\int_{-\infty}^{+\infty} \psi_A^2 \, d\tau = 1}$$ Normalization

④ $\int_{-\infty}^{+\infty} \psi_A \psi_B \, d\tau = \text{zero}$ Orthogonality

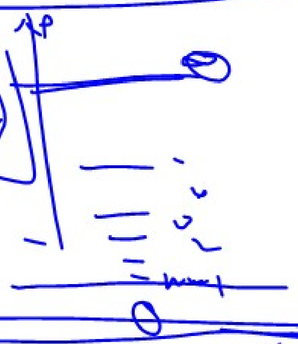
$$\left(-\frac{h^2}{8\pi^2 m}\left(\frac{\partial^2}{\partial x^2}\right) + V_{(x)}\right)\psi = E\psi$$

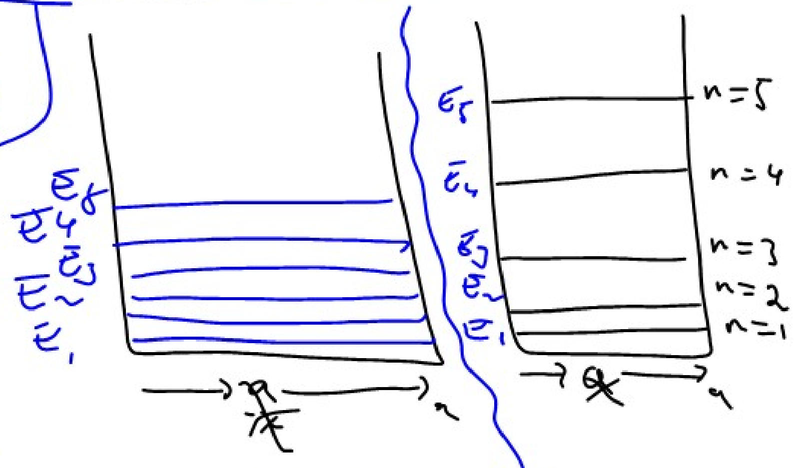


$$-\frac{h^2}{8\pi^2 m}\left(\frac{\partial^2\psi}{\partial x^2}\right) - E\psi = 0$$

$$\boxed{E_n = \frac{n^2 h^2}{8 m a^2}}$$

$$\boxed{E_n = -R\left(\frac{1}{n^2}\right)}$$



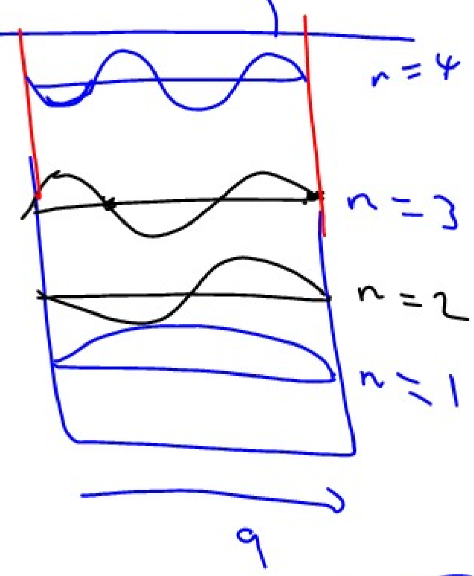


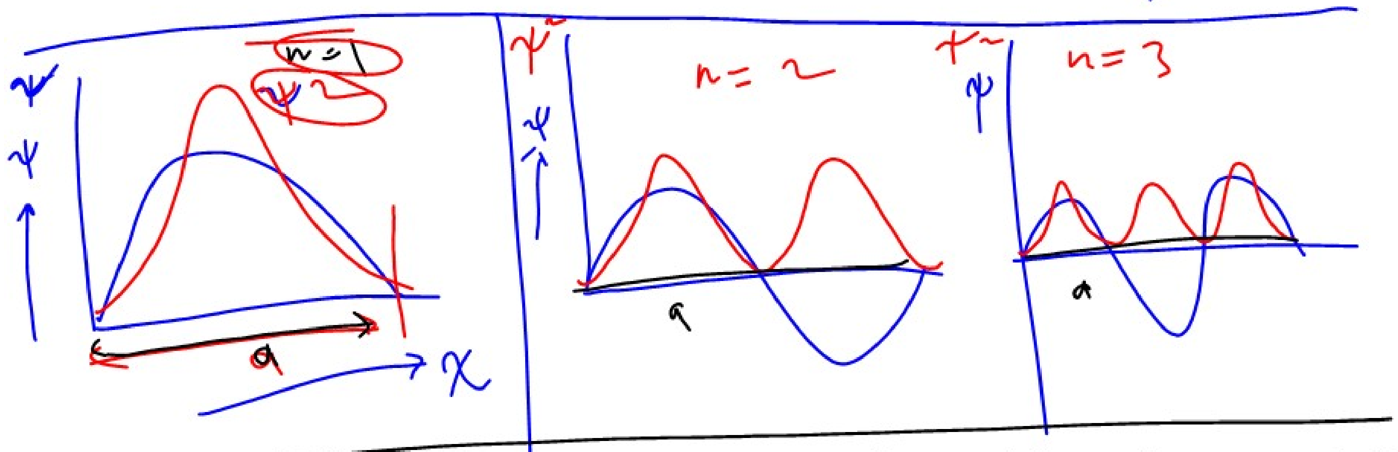
only if $\boxed{2L = n\lambda}$

$2a = n\lambda$, $n \to 3$

$2a = 3\lambda$

$\frac{2}{3}a = \lambda$





Q.Nos

$n \equiv$ principal Q.N. $n = 1, 2, 3, 4, 5, \ldots$

$l \equiv$ azimuthal Q.N. $l = 0, 1, 2, 3, 4, \ldots, (n-1)$ → s, p, d, f, g

Subshell Angular Momentum

$m_l \equiv$ mag. orbital Q.N

for a given l: $m_l = -l, -l+1, \ldots, 0, \ldots, l$

$l = 2$ $m_l = -2, -1, 0, +1, +2$

n=2
- $l=2$ — $m_l = -2, -1, 0, +1, +2$
- $l=1$ —
- $l=0$ —